

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/24/22**

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 1/24/22 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

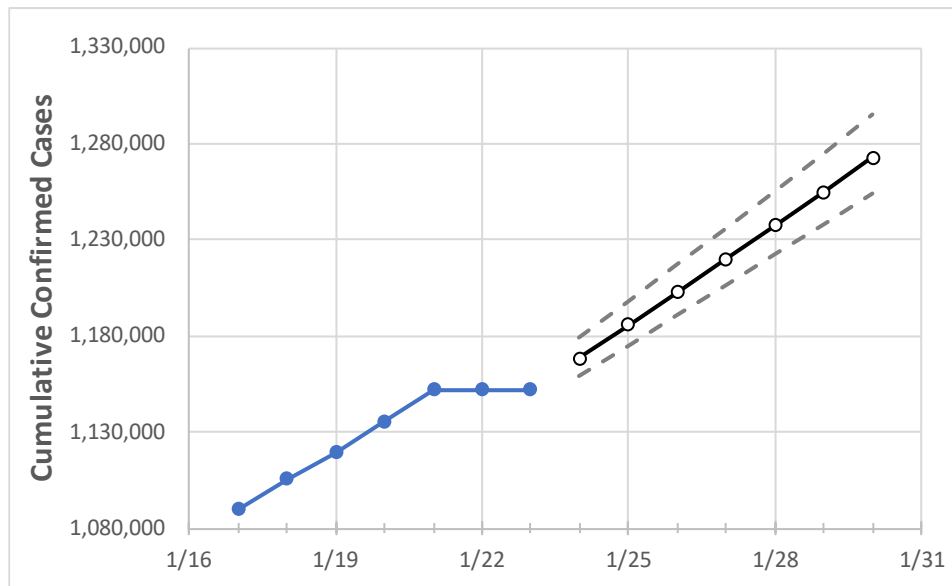
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Washington State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30
Washington	1,135,778	1,152,026	1,151,835	1,151,835	1,168,682	1,185,689	1,202,792	1,219,977	1,237,436	1,254,998	1,272,776

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

Washington Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30
Benton	40,219	40,893	40,893	40,893	41,576	42,266	43,017	43,762	44,571	45,387	46,243
Clark	66,692	66,597	66,501	66,501	68,507	70,632	72,769	75,077	77,455	79,978	82,603
Grant	20,354	20,685	20,685	20,685	20,920	21,163	21,421	21,670	21,940	22,209	22,503
Island	7,270	7,423	7,423	7,423	7,576	7,729	7,880	8,036	8,197	8,360	8,528
King	296,665	300,503	300,503	300,503	305,285	309,994	314,698	319,433	324,134	328,830	333,563
Kitsap	29,088	29,502	29,502	29,502	30,085	30,682	31,266	31,883	32,499	33,135	33,776
Pierce	151,414	153,896	153,896	153,896	156,063	158,271	160,499	162,754	165,004	167,298	169,564
Skagit	18,001	18,349	18,349	18,349	18,609	18,872	19,144	19,417	19,701	19,981	20,269
Snohomish	114,447	116,111	116,111	116,111	118,106	120,092	122,110	124,120	126,190	128,300	130,390
Spokane	96,571	98,103	98,103	98,103	99,419	100,748	102,135	103,563	105,074	106,577	108,141
Thurston	36,758	37,260	37,260	37,260	37,824	38,390	38,955	39,526	40,104	40,683	41,261
Whatcom	28,301	28,915	28,915	28,915	29,419	29,941	30,461	30,987	31,530	32,070	32,612
Yakima	55,699	56,429	56,429	56,429	57,319	58,262	59,219	60,236	61,286	62,393	63,534

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

Washington Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	1/20	1/21	1/22	1/23	1/25				1/27				1/29			
Benton	40,219	40,893	40,893	40,893	42,266	(8,453)	[2,029]	{1,014}	43,762	(8,752)	[2,101]	{1,050}	45,387	(9,077)	[2,179]	{1,089}
Clark	66,692	66,597	66,501	66,501	70,632	(14,126)	[3,390]	{1,695}	75,077	(15,015)	[3,604]	{1,802}	79,978	(15,996)	[3,839]	{1,919}
Grant	20,354	20,685	20,685	20,685	21,163	(4,233)	[1,016]	{508}	21,670	(4,334)	[1,040]	{520}	22,209	(4,442)	[1,066]	{533}
Island	7,270	7,423	7,423	7,423	7,729	(1,546)	[371]	{185}	8,036	(1,607)	[386]	{193}	8,360	(1,672)	[401]	{201}
King	296,665	300,503	300,503	300,503	309,994	(61,999)	[14,880]	{7,440}	319,433	(63,887)	[15,333]	{7,666}	328,830	(65,766)	[15,784]	{7,892}
Kitsap	29,088	29,502	29,502	29,502	30,682	(6,136)	[1,473]	{736}	31,883	(6,377)	[1,530]	{765}	33,135	(6,627)	[1,590]	{795}
Pierce	151,414	153,896	153,896	153,896	158,271	(31,654)	[7,597]	{3,798}	162,754	(32,551)	[7,812]	{3,906}	167,298	(33,460)	[8,030]	{4,015}
Skagit	18,001	18,349	18,349	18,349	18,872	(3,774)	[906]	{453}	19,417	(3,883)	[932]	{466}	19,981	(3,996)	[959]	{480}
Snohomish	114,447	116,111	116,111	116,111	120,092	(24,018)	[5,764]	{2,882}	124,120	(24,824)	[5,958]	{2,979}	128,300	(25,660)	[6,158]	{3,079}
Spokane	96,571	98,103	98,103	98,103	100,748	(20,150)	[4,836]	{2,418}	103,563	(20,713)	[4,971]	{2,486}	106,577	(21,315)	[5,116]	{2,558}
Thurston	36,758	37,260	37,260	37,260	38,390	(7,678)	[1,843]	{921}	39,526	(7,905)	[1,897]	{949}	40,683	(8,137)	[1,953]	{976}
Whatcom	28,301	28,915	28,915	28,915	29,941	(5,988)	[1,437]	{719}	30,987	(6,197)	[1,487]	{744}	32,070	(6,414)	[1,539]	{770}
Yakima	55,699	56,429	56,429	56,429	58,262	(11,652)	[2,797]	{1,398}	60,236	(12,047)	[2,891]	{1,446}	62,393	(12,479)	[2,995]	{1,497}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.